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MEMORANDUM
RM-6054
AUGUST 1969

AN INFORMATION SYSTEM FOR THE NATIONAL SECURITY COMMUNITY

Seyom Brown, Paul Y. Hammond, William M. Jones and Robert L. Patrick

The **RAND** *Corporation*
SANTA MONICA • CALIFORNIA

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This study is presented as a competent treatment of the subject, worthy of publication. The Rand Corporation vouches for the quality of the research, without necessarily endorsing the opinions and conclusions of the authors.

Published by The RAND Corporation

PREFACE

This Memorandum is the product of a study of the possibilities of applying electronic information handling techniques to the processes of the national security community of the U.S. Government. It was begun in mid-1968 and sponsored by a separate grant.

The original purpose was to examine the potential use of automated information handling procedures for that community and to make the findings available to the new administration in Washington in 1969.

Since the project began, the Johnson Administration has ended and the Nixon Administration begun, underlining the indeterminacies that must be addressed in such a study. The organization of the national security community was, in fact, changed by the new administration -- much in the direction anticipated in earlier drafts. Hence, it has seemed unnecessary to report organizational change proposals below.

This report poses the question whether automated information handling is the direction in which to take the institutional development of the office of a major political executive. If an affirmative answer is taken, then our technical proposal can serve as a model for an evolving system and provide preliminary guidance for a system design.

SUMMARY

This paper suggests design principles for an information handling system to serve the U.S. Government in the national security field. It does not provide a detailed design for such a system but rather outlines its general features and relates them to the significant characteristics of the existing human organizations into which such a system would be introduced, particularly the operation of the organizational structure and the motivations of the officials.

National security decisions are made and policies are established in an intricate organizational context which includes a veritable sea of inter and intradepartmental and agency communications. The contemplated national security information system cannot and should not be viewed as replacing this communications ^(LINK) nexus. The community that is involved in the national security policy process and which would be served by the national security information system has many powerful departmental components with different tasks and interests. This community is replete with formal and informal communications channels and somewhat fettered by a wide variety of formal and informal rules concerning access to certain categories of information. It is sometimes a provider of data to the president, sometimes a provider of analyses and recommendations, and sometimes both. This is the organizational environment into which a national security information system would have to be fitted.

Despite the heavy flow of information, insuring that all information considered pertinent is available when it is needed is a major problem. The agencies involved have legitimate incentives and the means to limit full cooperation with each other. The problem is how to get them to increase their cooperation and expose their differences without changing the structure or proportions of their relationships except through incremental adjustments. Documents and messages need to be brought together on a schedule that permits adequate analysis and, when appropriate, referral. The system and procedures proposed would reduce some of the practical impediments to the flow and handling of opinion and information within the community, offering incentives

Erosion

to all members, but some extra ones to the Executive Office staff. Its initial effects should be modest by design. Although the specific future use is, and is meant to be, indeterminate, one of the major system design features is the allowance for growth into new procedures. For example, it could grow incrementally into a "common market" of national security policy-making.

The proposed system would be designed to exploit the ability of an automated storage and retrieval system centered in the Executive Office of the President, to *permit* executive agencies and departments to maintain in ready availability to the president their recommendations for national security actions, together with supporting data, and permit the president to encourage them to use the system in this manner. To this degree, the functional advocacy process is to be exploited to encourage maximum use of the system. To this end the system must be adaptable to a wide variety of management styles, must exploit the incentives to stimulate voluntary use of itself, must complement other existing formal and informal information channels and data pools, and as a matter of practicality, must be designed with the recognition that future growth and unforeseen procedural change is likely.

To meet these requirements, a community-controlled system with appropriate safeguards for the handling of various types of classified information is suggested. Because the specific load on the system is difficult to estimate (experience suggests that current manual loads are not good gauges of automated systems loads) a "starter kit" hardware and software system, both readily available, is recommended.

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I. THE HUMAN ORGANIZATIONAL CONTEXT

In the conduct of foreign relations and the pursuit of national security, each president has his own concept of effective presidential performance, his own special work habits, and other unique characteristics. These and his situation -- the sequence in which world events unfold and matters come to him for decision -- make his demands for information unique and quite unpredictable in content and form. However, certain patterns can be observed in the operation of the national security community around which an information system could be designed.

ORDER AND FLEXIBILITY

The chief executive of any large organization faces a fundamental conflict between administrative order and his unpredictable interest in certain details, between his advance preferences about what in general to delegate and his judgment in the event about specific matters. Even where he is entirely free to organize things as he chooses, he cannot escape this dilemma between participation and delegation. No matter how committed to the delegation of decisions and other administrative tasks the chief executive may be, unforeseen circumstances may force him to intervene and deal with things that he has left to others. The American presidency is no exception.

Several additional factors complicate this dilemma of administrative orderliness and flexibility for the president. First, he is not free to reorganize the national security community at will. While his constitutional powers are extensive and he has few restraints on how he organizes his own office, the principal agencies involved derive their authority directly from organic statutes. They are major sources of information and major repositories of expertise, and their own heads, even though they serve at the pleasure of the president, have some independent public status. The chief executive, therefore, must not assume that his interests and theirs are identical and that he will receive the information he needs to oversee them.

Second, since he sits on the top of a relatively flat organization of quite formidable proportions, the president has to depend

heavily upon staff assistance, yet his staff is in a poorer position than he to get the information he needs. Presidential staffs have, in the past, been bypassed by agency chiefs who wanted to deal directly with the chief executive. For his staff, the major information problem is acquisition.

IMPEDIMENTS TO INFORMATION ACQUISITION

In certain ways, even an agency head's standing as a presidential adviser can work against the information needs of the national security community. To the adviser, his "in" with the president is a valuable asset, but this depends upon the president's perception of the adviser's utility. In turn, that utility tends to rest in the first instance on the president's sensing that the adviser shares his goals and purposes, and only secondarily on the adviser's capacity for candor and critical analysis. The adviser whose view is regularly shared by the president is likely to become known as a presidential alter ego. In the stress of business, the value of enhancing his standing with the president can lead the adviser to mirror the president's preferences rather than to question them. Thus, on matters of small importance to the adviser, he can, by anticipating presidential preferences, build up credit against the day when he needs presidential support for a position he considers crucial to his agency's interests.

These considerations are common in interdepartmental advisory and coordinative efforts. They persist because of the severe demands on information handling that prevail at the center or top of large organizations, including the Executive Office of the President, for agencies of the U.S. Government must settle most issues without demanding Executive Office attention. Moreover, any U.S. agency normally encounters serious disincentives to provide information to the White House. The agency may prefer "plastering over" or "bargaining out" of interagency policy papers, differences in evaluations, and conflicts in interpretations rather than confronting the president with them. Conversely, the agency may seek an exclusive hearing for its viewpoint in order to persuade the president out of earshot of rival agencies.

BEYOND ACQUISITION: SELECTION AND ANALYSIS

Furthermore, the information "market" within the executive branch is never without structure or boundaries. Discussion and negotiation are rarely extensive enough to satisfy all highly motivated spokesmen that they have had an adequate hearing. In these conditions it is difficult to distinguish between justifiable expeditiousness and information-suppressing strategies that mark a conflict in interest between the chief and his subordinates. The White House needs data and informed opinions selected and analyzed for it, if only because of conflicting demands for attention and the press of time. But subordinate agency officials often select and analyze for purposes that are narrower or at least different from the criteria of the White House. For the Executive Office, therefore, a second major information problem is analysis to filter, reorganize, and evaluate data to make them relevant to presidential purposes.

This is based on the question asked. Not different.

Functional and regional compartmentalization can also work against the ventilating effects of the natural adversary process. Reporting chains often run through the regional offices of the principal national security agencies in Washington. Yet the regional specialists can be a fairly cohesive professional group that identifies with a particular set of policies toward their regions. As a result, the same policy options will be stifled in each agency. For example, if a mildly pro-Pakistan element became dominant within South Asian regional bureaus in the various agencies, the "pro-India" case in a matter as important as U.S.-arms supply policy to the subcontinent might be repeatedly stifled.

Broadly speaking, then, the information problem of the Chief Executive is a combination of (1) acquiring, (2) selecting, and (3) processing -- filtering, arranging, and analyzing -- data. He has not been the original collector of most of the data that he acquires, but a higher point of referral for the action agencies of the executive branch. He cannot assume that the information he wants will reach him when he wants it and in the format that he prefers. He therefore has an interest in the acquisition and processing of data even though he receives a heavy flow of documents and messages as a routine procedure.

AN INFORMATION EQUILIBRIUM

To be sure, the president's constitutional authority as Commander-in-Chief and chief diplomat are considerable. The principal agency heads concerned with national security are his appointees, and they deal with issues that usually cross departmental boundaries. They need him and each other to deal with their common problems. The ebb and flow of information and advice may therefore be considered an equilibrium reached among a number of forces that both promote and discourage a common view and common solutions. Nonappointive, semi-permanent, department personnel, viewing this ebb and flow as a normal matter, contribute to a stable equilibrium.

An important premise for the information system proposed here is that the national security community is a system in equilibrium. Consequently, small changes in a community component produce adjustments throughout the community equilibrium. It is this system's view that makes the effects of the proposals offered here other than trivial.

II. SYSTEM PRINCIPLES AND REQUIREMENTS

An information system for the national security community can vary from audacious to modest in its scope, in the envisioned rapidity with which it is expected to change existing patterns, and in its risked disruptions. The example that follows is deliberately not audacious, reflecting the currently accepted strategy in the data processing field, as well as constraints upon the White House. Instead, it stresses the incremental development of an information system that depends heavily upon voluntary cooperation.

We propose, as a major example of possible systems, a limited information handling system that consists of two computers (one primary and one backup) with on-line subscriber stations for the White House executive offices, a microfilm production facility, a series of magnetic tape typewriter subsystems for the initial preparation of copy, and on-line remote agency stations for information entry. All of the equipment needed for the system is available today, although it has never been configured in exactly the pattern to be described. Further, existing computer programs and supporting software can be used with relatively little adaptation. Doubtful

The system described will supply a measurable benefit by accomplishing routine functions better. It will allow the dozens of agencies who now communicate with the National Security Council to standardize some forms of their communications, to begin to cooperate in computer-based information handling for their mutual benefit, and to lay the groundwork for additional extensions as they are identified and justified. All of this can be done reliably, at a reasonable cost, and without violating security.*

* In the system to be described in this Memorandum, it is a foregone conclusion that security and related access controls must be provided. To avoid clouding the discussion, let it be known that the computer system will take note of the level of security clearance of each "subscriber," computer operator, remote facility, and communication line. It will provide both need-to-know clearance controls and controls over levels. Thus, whereas a subscriber may request information corresponding to his interests, he will only receive that information if he is properly cleared and certified, much as in the current hand-carrying and mail system, but faster and more reliably.

ADAPTABILITY

The major feature of the proposed information system is a flexibility and a controllability that will allow it to accommodate a wide variety of agency styles of conducting business. The system should not modify any major department's or agency's scope of authority and influence, nor impose bounds on the kind of information and/or summarization that the originating agency might consider of interest to the White House. If organizational changes prove desirable, they might be instituted in parallel with the system, but not as a consequence of its characteristics.

Incremental development is required because the system will need to grow and adapt continually to changes in the personal working styles of the principals and in their relationships to each other. This adaptability will be particularly important during changes of presidential administration.

VOLUNTARY USE WITH INCENTIVES

ILLEGIB

The proposed system is designed for voluntary use. We assume that even though the gains of a computer-based hardware system could be substantial, the adoption of such a system would not be attractive to a chief executive if it required that he repeatedly exert his authority over a prolonged period of time and on many detailed and rather technical issues in order to get officials and their agencies to use it.

To make voluntarism work, the system's subscribers must have some incentive to use it. The incentives offered are initially mechanical.

The system proposed will increase the potential of the Executive Office to handle (particularly to store and screen) messages and information. At the same time, it will provide the convenience and reliability of message distribution for agencies subordinate to the President within the national security community, and thus enhance the inclination of these agencies to enter messages. Furthermore,

this inclination can be strengthened by the competitive situation: the agency head will want his views known so that they can compete with the views of other agencies. Besides offering them speed, reliability, and other conveniences, the system will be able to offer potential users the prospect that it will be a valuable additional channel of access to the White House. The more the Chief Executive insists that the agencies in the national security community deal with him through the system, limiting the alternative channels to himself and specifying what he wants from them through the system, the stronger will be the incentives he will generate for them to use the system and use it on his terms.*

Very limited
capability to
get actual
questions asked
and probabilities
explored.

The missions of the agencies contiguous to the NSC are varied and each agency will want to maintain and control its own data bank. Their doing so is desirable because of the propensity of different people with different intellectual tasks to organize and index data differently -- that is, to treat the same data in widely varying categories of importance. A capability for automatic dissemination is proposed for items entered into the system, but it is not necessary to bring the data processing of all the agencies into a single pool for efficient data handling. On the contrary, an enforced data pool would be disruptive, cumbersome, and costly. A voluntary one holds considerably more promise. The more the subscribing agencies use the system, or

you get
what someone
wishes to put
in. Not too
good

* This is not a new situation. As one of the writers observed about the NSC under Eisenhower:

It is a well-documented fact that cabinet meetings have seldom amounted to much because cabinet officers prefer to transact their business with the President without the interference of other executive department heads. The more a President actually refuses to discuss and decide anything that does not go through his cabinet system, the more likely it is that the real issues will come up there. No doubt the determination and professional inclinations of President Eisenhower have stood him well in his resolve to strengthen the performance of his cabinet and of the NSC. Yet it seems unlikely that he has stopped off all channels for maneuver. Paul Y. Hammond, "The National Security Council as a Device for Interdepartmental Coordination: An Interpretation and Appraisal," *The American Political Science Review*, Vol. LIV, December 1960, pp. 904-905.

anticipate using it, the more they will make their internal information handling procedures compatible with it.

CONTROL OF PROCEDURES

The procedures for indexing and filing must be the responsibility of a central system operator. However, the agency entering the data must decide what data to put into the system and how to apply the indexing procedures to it.

Normal security requirements dictate that access control to the system's data be by level and by need to know. Safeguards will be required for security in the transmission process.

The system should allow for wide variations in the data, *always associating data inputs with the originating agency*. It should allow for the insertion of data, reports, evaluations of situations, and recommendations from functional agencies and other advisory agencies and committees.

INCREMENTALISM

The improvement of information handling in the national security community should proceed incrementally for several reasons. To begin with, the main problems of improvement are not overall system design, but the intellectual tasks of category design, index structure, and information distribution. These tasks will require numerous adjustments and take time. (For instance, one computer authority has estimated that this system would only become useful after two years in operation.)

Incremental development is required also because the system must be introduced without disrupting an existing flow of communications. It should not be expected to rapidly replace current systems and procedures, but to run parallel with some current communication links. (The continued existence of these communication channels seems generally desirable.)

In sum, the main features of the system are that it is: (1) incremental in its implementation and development, (2) voluntary, (3) compartmentalized in relation to other information systems in the

Federal Government. In addition, information never loses its identification with the agency which entered it into the files -- a fact essential for evaluating the information.

These features permit some variation, primarily in the degree of centralization and voluntariness. Because we propose incremental development, some decisions about centralization and voluntarism can be postponed. In fact, actions by the National Security Council or White House to obtain compliance with utilization "rules" of the National Security Information System will probably remain an active question throughout the system's useful life.

*What guarantee is there that
the 'incremental Security' system
may screen important information
from the user. This leads to
serious analysis and reports to
the President. Not Good*

III. SYSTEM DESCRIPTION

GOALS

The system detailed below will meet the following goals:

1. It will provide automated information links between the highest echelons of the United States Government, in particular between various agencies and White House subscribers.
2. In addition to storing and routing messages, the system will supply an alarm-and-follow-up procedure so that traffic of utmost importance is called to the attention of the addressee or his representative with receipt positively acknowledged to the system.

ILLEGIB

It will provide a storage and retrieval facility for document abstracts and messages of long-term potential interest. Any subscriber will be able to interrogate these files by subject and receive a reading list of the items to which he is authorized access.

The computer-based files will be augmented by a microfiche system containing the full text of messages and documents. Thus, if a White House subscriber retrieves an abstract from the computer-based system and finds he has an in-depth interest, the full text can be obtained from a microfiche depository located at his terminal.

The computer-based system will also maintain a list of subscribers' interests. Incoming messages will be screened against this interest list and will be automatically routed to additional interested readers other than the addressee unless prohibited by the originating agency or author. The search program that allows a subscriber to interrogate and retrieve stored information will also allow a subscriber to interrogate the interest file and receive the names and locations of other individuals who have interests corresponding to his own.

6. The system will also allow precise administrative control over

message routing, provide security control, and a duty officer to handle exceptions or unforeseen circumstances.

CENTRAL FACILITY

The proposed system centers about an Executive Office consisting of the computers and a microfiche production and storage facility all located in an air-conditioned vault. The computer equipment consists of one main and one backup machine with related tapes, disks, and other peripheral input/output devices.* There are also disk units, magnetic tapes, a card reader/punch, and a printer. Appropriate communications control units are required to interface encryption/decryption devices.

The whole information system would be under the control of a White House master operating station. One or more duty officers would man this station continuously and would be responsible for switching computers in the event of trouble, for recovering from system malfunctions without data loss, and for resolving priority conflicts. Since they would have subject matter specialists on call, they would also be able to assist operators at remote stations in indexing messages in accordance with the approved procedures and in resolving problems encountered in communicating with the central facility.

The other portion of the facility is a microfiche laboratory equipped to prepare microfiche from full-sized, hard copy documents.**

* For analytical purposes only, until an information flow study can be completed, a computer facility housing IBM equipment was detailed and priced. The configuration chosen is shown schematically in Appendix A. (This configuration was selected by a member of the RAND Computer Science Department staff and has not been verified or approved by IBM representatives.) It consists of two IBM 360 Model 40s, each with 256K bytes of core. It must be understood that this is a typical machine choice only and not a specific recommendation for action.

** A single copy of a document to be entered into the microfiche library would be presented to this laboratory where it would be photographed, organized into a microfiche sheet, reproduced the correct number of times, and prepared for distribution to the remote facilities.

In the configuration proposed, all key components including data files,* are duplicated; alternate paths are provided for all critical communications. This configuration makes possible the ultra-high reliability required for an information system to support the NSC. This reliability is achieved in several ways. One is by routing the messages to both computers and having both computers log the incoming message stream on magnetic tape to guard against the loss of precious material in the event the computer responsible for message processing were to malfunction during the processing of a message.** A second is the twin computer/twin file setup. A third is in duplexing the communication control units so that the incoming phone lines may be routed to both devices. Isolation switches are provided so that communication gear can be switched to the reserve computer in the event either computer becomes inoperative.***

*The following list of files is illustrative, not exhaustive:
Subscriber clearance and location
Subscriber interests
Standard distribution lists
Current message file
Recent message file
Indexes to message files
Administrative files
Pending file
Alert files for each remote location
Document abstract/milestone message file
Indexes to abstract file
Microfiche control file

** Both computers are provided with separate type 2314 disks. A connection is provided between the two computers so that the message-processing computer may send information to the reserve computer to allow the reserve computer to update its 2314 disk files in synchronism with the primary file. Thus, in the event of a computer malfunction, the reserve computer can take its copy of the incoming message, load the message-processing program, update its own files, and proceed to carry the message load until the processing computer is repaired.

*** IBM's Information Management System does not handle the alternate routings described in this paragraph, although the IBM hardware provides the paths. The software will need to be modified so the system can survive all single outages, many double outages, and some triple outages before ceasing to function.

The computer will store indexed messages in full text, and abstracts of all documents inserted by agencies or subscribers. Full text copies of the documents will be held on microfiche so that an interested subscriber may read the document in its entirety. Note that this proposal makes no attempt to suggest changes in the way these products are produced by the various agencies. This proposal merely suggests improved handling and availability of these documents after they are released to the senior community.

REMOTE AGENCY FACILITIES

Each remote Agency Facility will contain one or more IBM Magnetic Tape/Selectric Typewriters (MT/ST) modified to act as a remote terminal.* These terminals are connected to the central computer through suitable encryption/decryption devices and appropriate communication circuits. In addition, each Agency Facility will contain a microfiche reader with a hard copy attachment and several safes, one of which will contain the microfiche document file. Each remote Agency Facility must be located in a secure area.

Within each cooperating agency there will be a series of standard Magnetic Tape Selectric Typewriters. These units will allow an agency to write, rewrite, and edit input for the system with a minimum of effort. These devices will also assist the agency in preparing documents, and as a by-product, will also produce a magnetic tape cartridge copy of the final document. When the document is released to the system, the magnetic tape associated with that document can be transported to the Agency Facility and electrically entered into the information system. If the document is also to be published, the same magnetic tape can be used in automated printing processes. No other changes in agency procedures will be required.

* For a schematic of this equipment and approximate total cost see Appendix A. For a brief explanation of software considerations see Appendix B.

IV. ANTICIPATED SYSTEM CONSEQUENCES

The proposed system is designed to proceed incrementally and intended to affect an existing equilibrium. Patently, its effects will be subject to future decisions. Nonetheless, it would be helpful to consider what changes might result.

THE EQUILIBRIUM CHANGED

Suppose we begin with the equilibrium: Increasing the data-handling capacity of the national security community would shift the boundary and modify the filters that affect the flow of information and advice in that community. At present, of course, the White House staff can to some degree probe agencies for divergent views in order to test the quality of the advice available to it. The proposed system can make it slightly easier to probe. The means are simply extensions of White House staff work. A statement about NSC paperwork in 1960 expresses their potential effect.

The momentum of [NSC] staff work, by having available facts and arguments from the previous consideration of the (same or similar subjects, can the more effectively evoke current information from the departments and evaluate current departmental judgments and arguments. For instance, simply to record and keep the positions of an agency on file, together with the evidence it provides on a particular subject over time, can build up a record which would at least limit its freedom of maneuver and might force it, increasingly, to discuss the subject on its merits.*

IMPROVED DATA SELECTION AND ANALYSIS

Better data handling in the configuration proposed should make it possible to improve the quality of staff work in the Executive Office, as the above quotation suggests. It should increase the incentives for the agencies concerned with national security problems to support the Executive Office and to work with each other. Any agency must concern itself with wearing out its welcome with the

*Hammond, "The National Security Council . . .," op. cit., p. 909.

president's staff. Increasing the Executive Office staff's capacity to handle these contacts with agencies amounts to welcoming documents and messages from them. Knowing that other competing agencies' messages and documents are being welcomed in the Executive Office, any agency will seek to take advantage of these channels.

With the situation changed in this manner, one should expect some improvement in the filtering or selection of those messages and documents that are to be given serious attention by the Executive Office staff, and an improvement in the staff's capacity to deal quickly with unexpected contingencies. Finally, even a document that is not given serious attention in the Executive Office can be valuable when storage and selective retrieval capabilities are high, for its availability can attest to the credibility of its originator's judgments and affect the probable acceptability of his future advice.

The ease and capacity of the system, moreover, could make agency-to-agency traffic more convenient yet not unduly intrusive on the Executive Office. With modest encouragement the proposed system could come to be used for some of this traffic. At least, its dissemination conveniences could make it of considerable use to its agency members when they want to communicate with other agencies at the same time that they are dealing with the Executive Office. Any such use of the system, of course, would add to the data available for the Executive Office staff.

The system should also provide a framework within which each agency in the national security community can develop its own autonomous information handling system, as several of them are now doing. The proposed system is so structured as to make convenient the development of compatible departmental systems and minimize the changes demanded of existing systems.

Finally, to some degree the proposed system should reduce the pressure to increase the size of the Executive Office staff. Like other central staffs, the Executive Office of the President is under constant pressure to grow. Whenever it does, this growth is at the expense of the agencies it oversees. While the system proposed is intended to accommodate different presidential styles, including

differences in the degree of the president's reliance on his staff, on the one hand, and his agency heads, on the other, the increased information handling capability, by bringing relevant expertise from the executive agencies closer to the president, could reduce the pressure to duplicate that expertise within his own staff.

ILLEGIB

UNCERTAINTIES AND OPTIONS

These projected consequences of the proposed system are possible but not necessary outcomes. Since it is intended to be incremental in its development, the system can be stopped, delayed, or turned back, and its development can certainly be modified as it is being implemented. No outcome can be guaranteed for it. Certainly one cannot guarantee an improvement in the quality of policy analysis and advice for the president because of it. It offers a prospect for that improvement, but no guarantee. And even if the prospect is fulfilled, that quality will, as has ever been the case, be the result of the quality of the personnel involved.

With or without the proposed system, agency heads must continue to decide how responsive and how resistant to be to Executive Office viewpoints and requests, how much of the internal workings of their agency's policy-making processes to reveal to the White House and to other agencies in the community -- how much value, for that matter, to place on the development of consensus among their own staff. The same considerations will prevail that have prevailed before -- among others, credibility and trust, the integrity of private advice within one's own agency and as adviser to the president, and whether to analyze issues as agency spokesmen, political actors, or presidential advisers.

V. SYSTEM OPERATION AND TECHNICAL FEATURES

INPUTS

As described in Section III, the basic input mechanism to the system will be the MT/ST typewriter. Prior to entering a document or message into the system, the originating agency will be responsible for indexing it. A thesaurus will need to be produced before the system can operate at all. It will have to be distributed to each cooperating agency so that a copy of it is available at each location where an MT/ST will prepare information for eventual entry.* A person trained to index must read the message or document and pick from the thesaurus of permissible descriptive words those key ones which describe the document.

Standards from within agencies.

A message enters together with the key words selected from the thesaurus plus such control information as the message originator, his agency, security level, compartmentalization information, the intended addressee(s), the priority of the message, and the expected period of interest. This control information and the document are on the same MT/ST magnetic tape cartridge that is hand-carried to the Agency Facility. There the cartridge is read into the computer. As the cartridge is read, its control information will be checked automatically by the system and any deviations displayed for resolution by the Agency duty officer.**

* Each Agency Facility will need a thesaurus for checking inputs and resolving problems. Further, each remote facility will require a book of instructions containing troubleshooting procedures and a separate flash-card containing emergency telephone numbers. These would presume the existence of user manuals, and manuals describing operating procedures for the Agency Facility and the Executive Office Facility. For further discussions about the thesaurus and other development problems see Appendix C.

** Depending on the outcome of further study, it may be desirable to allow additional inputs to the system in the form of punched paper tape, direct computer-to-computer input from information systems installed in a cooperating agency, or direct input from the terminal installed at an agency facility.

In the case of documents, the abstract, keywords, and control information are entered. The full text document is then physically transported to the Microfilming facility.

INPUT PROCESSING

As soon as an item is accepted by the computer in the Executive Office Facility and its control information checked, it will be processed. The addressee information will be stripped off, the addressee will be located by consulting the computer's subscriber file. The clearance level and access privileges of the addressee, the communication line, and the subscriber terminal nearest the addressee will be checked before the item is transmitted to him. In the event two or more items appear for processing simultaneously, an automatic priority scheme will govern the processing sequence.

INTERNAL DISTRIBUTION

ILLEGIB The computer system can hold an extensive list of subscriber names or offices matched against a list of their interests. This agency users of the system to address items to subscribers by ing interest areas. In addition, if the originator wishes, item to direct addressees has been transmitted, the computer able to compare the key words accompanying it with key words ed with subscriber interests and determine if a courtesy copy e provided to additional subscribers with the required clear- need-to-know.

RETRIEVAL

subscriber or his approved representative, assisted as necessary ty officer, can interrogate the computer system by entering st into the keyboard using key words chosen from the thesaurus lementary criteria. The computer will then search its files a combination of key words, item source, originating agency, e group, priority, security level, or message routing. Sub- content of items such as geographic location, proper names,

numeric values, etc., can only be searched for if they are encoded by using key words authorized in the thesaurus.

The proposed system permits searching the descriptive information related to a message or a document, but not its running text.* Further, the descriptive terms are established by manual indexing; automatic indexing is not proposed partly because of the significantly increased cost of storing entire documents within the computer.

Since the query-and-search procedure deals only with the descriptive information associated with an entry in a file, the same search procedure system can search a message file, an abstract file, or a file of subscriber interests. When completed, the search results will be typed on the terminal at the location where the query was entered. In the event the abstract file has been searched, the response will contain abstracts coordinated with the microfiche that contains the full text of the document.

ADMINISTRATIVE PROCESSING

The standby computer will be used for the development of the additional computer programs needed as changes are identified and for administrative processing. It will do maintenance on the internal lists and files, e.g., update them. It will screen new material and prepare it for updating the indexes to the files. It can also perform searches of a special nature. Finally, it will produce administrative reports on system traffic, system workload, system response, error rates, security and accountability records, and system usage statistics.

SENSITIVE DATA AND INFORMAL CHANNELS

The system under consideration is in no way viewed as eliminating any existing formal or informal communications channels. It is

*The full text of messages is held by the proposed system but no text search is provided due to the state of development of required software. Only abstracts of documents will be stored due to the states of the art in both hardware and software.

ILLEGIB

[REDACTED] ized that some data and information may be of such a classifica-
level or of such sensitivity that it would not be appropriate to
it into a computer system. Such special communication would be
d in the current manner. An important reason for continuing
existing formal and informal communication channels is as a backup in
event of catastrophic systems failure or unforeseen overloads. In
general, we think it appropriate to encourage the use of concurrent
communications along with the proposed system so as to provide a
richer context for the information in the system and to insure against
misunderstandings that might arise due to inadequate summarizations,
unfortunate wording, etc., as users learn to use the system.

Any computer-based system, installed in a critical application,
must be provided with administrative controls to allow surveillance
over its own operation. While the proposed system is structured with
a view toward a high degree of controllability by the using agencies,
no safeguards are provided against deliberate misuse, except with
respect to security. As with the current manual system, the ultimate
safeguard against misuse, malfeasance, and error lies with the people
who accept information from the system.

SCREENING

Increased information handling capability through the Executive
Office Facility is intended to increase information, and the result
could overload a subscriber unless he exercises discrimination in
what messages he sees. The system is designed to help him discriminate;
subscribers will be able to set up their own screens. They include
multiple category screens (e.g., subject, location, origin, and quality
rating), frequency,* and the possibility of (a) random or selective
sampling of traffic not normally seen, and (b) rapid probes into items
stored at the discretion of the subscriber. In fact, probably one of
the variations among individual officials who are subscribers is likely

*The number of messages between two or more subscribers could
serve as a screen. When some threshold, such as five per month, is
exceeded, all five could be brought to the attention of designated
individuals.

to be expressible as the ratio of the volume of regular information flow over the volume of specially requested data. The resulting ratio differentiates passive from active data consumers.

UNANTICIPATED INFORMATION NEEDS

How about a Telephone?

The proposed system can be partially responsive to unanticipated needs for information. In any large system, be it government or industry, unforeseen external events will occur. When one does, the system might fail to produce relevant data. However, a subscriber will be able to interrogate the list of interests of his fellow subscribers. Even if the system is unable to produce a reading list of documents bearing directly on the current new event (because none have been entered under an appropriate heading), the system will be able to produce at least the names of subscribers who are partially knowledgeable about documents and events *related* to the current emergency.

HIGH PRIORITIES

Telephone?

Another special feature of the system will be triggered by an item carrying an extremely high priority rating. It will be transmitted to a duty officer at a subscriber terminal as before, but will be accompanied by an audible alarm. Further, the computer will place a notation in a pending file and will expect a formal acknowledgement from the subscriber duty officer within a predetermined period of time. The subscriber will have to acknowledge the receipt to remove the alarm from the pending list. As ultra-important time-sensitive messages are transmitted in this way, the duty officer in the Executive Office Facility will be informed. Whenever an alarm is over-age, the duty officer in the subscriber facility will be reminded and the duty officer in the Executive Office Facility informed so that he may take appropriate action.

PERMANENT OR RETRIEVAL FILES

In addition to the messages and documents put into the system by various executive agencies, some of the communications flow through the system can, at the discretion of the originating agency, be singled out and placed in a retrieval file. This would have the effect of keeping such a message, paper, or analysis, in the permanent document file where it may be retrieved by its designated recipients.

VI. REJECTED ALTERNATIVES

Several alternative system designs were considered and rejected as were a number of particular hardware configurations. This section outlines the main reasons for their rejection.

To a computer this all numbers

A system could have been based on, and structured along the line of, the National Military Command System's information handling procedures. This system was rejected because it is intended primarily for the handling of large numerical data files, whereas much of the message traffic of interest to policy-makers in the national security field is largely text.

Another discarded candidate was a highly centralized system that implied a high degree of reliance for all communications. Such an approach would be too massive, too costly, too long in development and -- most significant -- would imply a revolutionary change in the administration of Executive branch communications.

Keep all the info. only a half million or so

Another discarded candidate would direct to the NSC a copy of all raw items addressed to each senior agency, and possibly intra-departmental working papers as well. This concept was discarded because of the questionable accuracy of raw data and because the contingent nature of working papers, while clearly understood by the responsible agency, may not be understood by an outside recipient. The difficulty here is the interpretation of raw data rather than a technical problem involving the information flow.

Candidates such as these would require direct and probably frequent assertion of presidential authority to enforce compliance by the agencies supplying information. The senior agencies, both by tradition and design, have (and should have) considerable autonomy in the conduct of their internal affairs. This autonomy includes a degree of control over the decision on when and whether to release information to other agencies and to the Executive Office. The selected system design emphasizes the voluntary approach to encouraging entry of information into the system. This emphasis will tend to lessen the need for repeated assertions of presidential authority.

The other general characteristic that has been avoided is massiveness and complexity of the initial design. Experience in the development of large information systems indicates the near impossibility of describing in detail all of the operations and procedures that will be required when a system is installed. The normal pattern of continuous change in operations insures that the using organization will have changed its procedures (and thus its requirements) between the time a large special-purpose system is designed and the time it is installed. A smaller initial system, made from readily available hardware and software components, avoids this preinstallation obsolescence.

*The massiveness of the proposed System
Unless absolute "by law" constraints cannot
be estimated by me. It's too big.*

VII. CONCLUSIONS

The National Security Council, the Executive Office Staff, and the senior intelligence community constitute a baffling complex of overlapping management for the outside analyst. In reviewing the work of other analysts, the authors felt that more would be gained by proposing a sample system and defining what it offered than by trying to analyze the needs of the NSC in the traditional way.

The system proposed benefits from a practical view of what could be done in about two years using available hardware and software. Many of the more appealing items from the literature were knowingly left out due to their current state of development. Perhaps, after deeper study, some of these more attractive features might be re-introduced; however, the system discussed will work, will contain the features described, and after an information flow study is performed can be defined, priced, and produced on a schedule.

The system proposed will hold full text copies of lengthy documents in microfiche repositories near the user; it will assist the using community prior to the release of messages and documents by supplying MT/STs to aid in the editing and writing chores. The central computer will hold abstracts of documents and their key words, and the full text of messages and their key words for query and immediate printout. It will also provide some administrative aid and permit certain operational statistics, not now available, to be automatically collected.

Are these worthy goals? Is a system of this limited scope a sufficient step forward? Do these goals justify, in dollars and in inconvenience, the installation of a system with features as described?

The *needs* of the NSC must predominate. The proposed system can be considered as a baseline reference to guide the analysis of those needs.

It seems pointless to engage in debate at this time over whether or not the proposed system is "best." The criteria for such judgments do not exist at this time. The proposal brings to the surface the much more important issues of basic capabilities and requirements. Should the philosophy of the NSC system aim for voluntary or enforced

participation? Is it possible to build and maintain a thesaurus in such a complex arena? Should a system be built that accepts the status quo and provides for gradual, evolutionary changes?

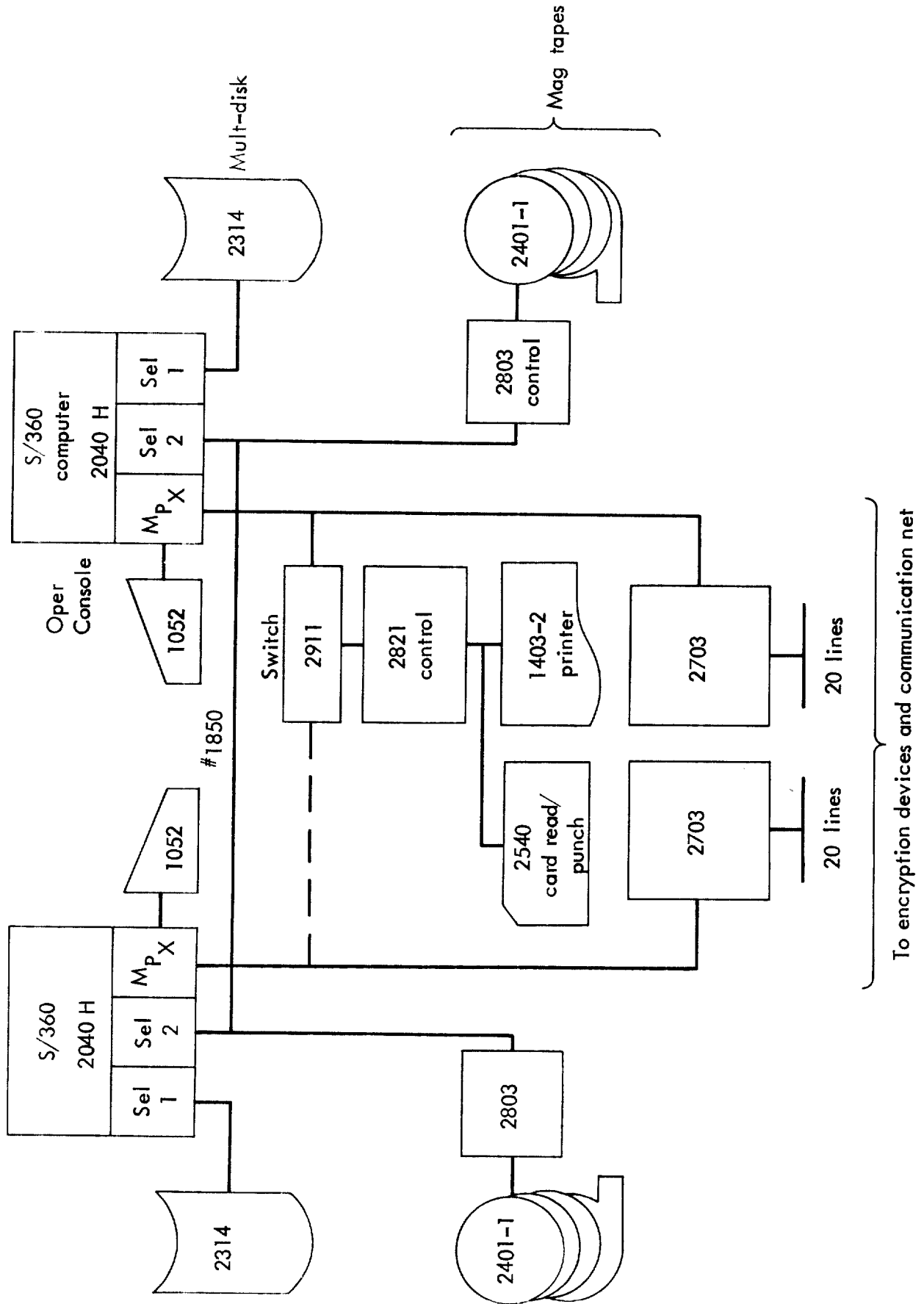
The system as described can be built. The important questions remain. Should it be built? How would it fit into the established community? Would it be usefully employed if installed?

Appendix A

HARDWARE AND COSTS

The hardware for the central Executive Office computing facility of the information handling system, and for a single remote facility, are diagrammed, itemized, and costed on pp. 28, 29, and 30. Total costs are then analyzed.

Executive office computing facility

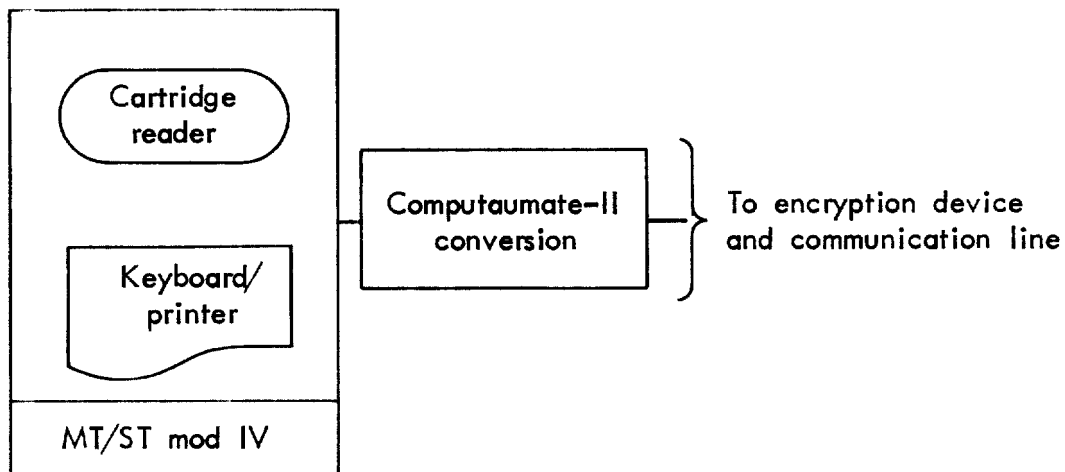


EXECUTIVE OFFICE COMPUTING FACILITY: HARDWARE ITEMS AND
THEIR RENTAL COSTS

<u>UNIT</u>	<u>MODEL/ FEATURE</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
2040	H	PROCESSING UNIT	2	10,505	21,010
	4427	FLT POINT ARITH	2	103	206
	3237	DECIMAL ARITHMETIC	2	118	236
	6980	1st SELECTOR CHAN	2	360	720
	6981	2nd SELECTOR CHAN	2	335	670
	7520	STORAGE PROTECTION	2	155	310
	7920	1052 ADAPTER	2	232	464
	1850	CH-CH ADAPTER	1	232	232
2314	A1	DISK STORAGE	2	5,675	11,350
1052	7	PRINTER KEYBOARD	2	65	130
2803	1	TAPE CONTROL	2	670	1,340
	3228	DATA CONVERT	2	46	92
2401	1	TAPE UNIT	8	345	2,760
2821	1	CONTROL UNIT	1	1,000	1,000
	8637	UCS ADAPTER	1	15	15
1403	2	PRINTER	1	775	775
	8641	UCS FEATURE	1	10	10
2540	1	CARD READER	1	680	680
2911	1	MANUAL C.U. SWITCH	1	266	266
2703	1	TRANSMISSION CONTROL	2	1,495	2,990
	7505	START/STOP BASE	2	77	154
	4619	TERMINAL CONTROL BASE	2	20	40
	4696	TERMINAL CONTROL TYPE I	2	36	72
	4878	LINE SPEED OPTION	2	10	20
	3205	DATA LINE SETS	6	77	462
	2711	LINE ADAPTER UNIT	2	134	268
	4647	LINE ADAPTERS	40	10	400
	4794	LINE ADAPTER MODULES	8	10	80

Total rental cost per month -- \$46,752

Remote Terminal Installation*



* Estimated to cost \$400/month each plus encryption equipment.

AN ESTIMATE OF TOTAL SYSTEM COSTS

The initial cost for a system such as the one proposed includes the cost for a design study, for computer programming, for file preparation and construction; for manuals, books of procedures and other documentation, and for initial training. It is estimated that the initial start-up costs will be approximately \$1 million spread over a two-year period. In addition, monies must be spent for facilities and equipment. *Until site surveys are made the total amount of expenses related to physical facilities, vaults, stand-by electric power, and purchased equipment cannot even be estimated.*

It is assumed that the computer and related electronic equipment will be rented. The system outlined in Appendixes A and B involves an estimated monthly expenditure of \$50,000 for the Executive Office computing equipment, and an estimated monthly expenditure of about \$400 per remote terminal. Thus, if 20 remote terminals were installed, the total monthly rental would be approximately \$58,000. To this, an additional amount would need to be added for supplies and miscellaneous expenses. Thus, the total hardware rental *per month* would be about \$65,000.] !

To this cost, we must add the manpower to operate the system. If 2 men are assumed for each remote facility, and they are to be manned continuously, 160 people will be required. The central facility would require about 8 computer operators per shift, or 32 additional. To this, we would need to add 3 software specialists, 5 applications programmers, and 4 supervisors. The total manpower would be 204 computer personnel plus an additional 12 photographic personnel to operate the microfiche system.

Thus, the system proposed would cost approximately \$5 million per year to operate, including \$4 million for computer personnel, \$200,000 for photographic personnel, and \$780,000 for equipment rental.

Appendix B

SOFTWARE AND APPLICATIONS PROGRAMSCOMPUTER SOFTWARE

There are several computer manufacturers who make hardware adequate for the system conceptualized here. However, at this writing, only IBM has a set of computer programs approximating that required. The task requires software to provide the normal operating system functions, a data management function, the security control function, and to support the on-line terminals operating in an inquiry mode. No manufacturer, including IBM, has software with the required security facilities. However, IBM software, known as IMS/360, provides all other functions. No other manufacturer is known to have an equivalent set of software.

In addition to IMS/360 and its related operating system OS/360, IBM has the required complement of compilers, utility programs, and service routines. This aggregate of software will require modification for use in a highly secure environment, and will need extension to handle the particular configuration of devices chosen for the remote facilities.

APPLICATIONS PROGRAMS

There are no message-handling programs available to perform the information dissemination and retrieval tasks proposed. These application programs would need to be written to operate under IMS/360 and to provide the needed functions. The more obvious application programs are: load/unload, update, search, list, start/restart, audit, and administrative reports.

Appendix C

SYSTEM DEVELOPMENT PROBLEMS AND POSSIBILITIES

The development of a useful message storage and retrieval capability within the contemplated National Security Information System is one of the more important initial tasks. The indexing, filing, and retrieval system suggested in this Appendix is similar in development concept to the hardware equipping plan, representing a "starter-kit" that would have an early but limited utility and would serve as a basis for growth.

Because of the diverse kinds of problems that interest or are addressed by the numerous executive departments and agencies involved in the national security process, diverse categories of items must be accommodated by the system. The *initial* definition of item categories, the *initial* estimate of item volume and the *initial* estimate of item storage requirements are all subjects that must be addressed by a detailed information flow study. Such a study must be one of the first tasks addressed in the system development process. It should be emphasized that an automated information system, such as the one under consideration, must be expected to stimulate additional load and to be capable of adjusting to constantly changing message formats and categories and to accept a growing number of subscribers. It follows that the starter system must have a capacity for the anticipated growth and change.

Because of the very wide spread of topics of interest to the national security area, a particularly flexible and powerful indexing system is required. We propose the use of a procedure for indexing based on a "key word" concept. It is envisioned that such a procedure would be used within a larger categorization (indexing) scheme that covers major originating agencies, message categories,* and general subjects. For example, the system should respond readily to such

*The specification of index terms for originating agency and item category will expedite retrieval.

retrieval requests as:

- A) *What is the current DOD (originating agency) recommended action (position paper -- a message category) for military assistance (a general subject category) to South Korea (a key word)?*
- B) *Retrieve all messages input by State and the CIA (originating agencies) that have information on the South Korean (key word) economy (key word).*

The specific key word indexing instructions proposed would include an up-to-date list of thesaurus terms and sample messages in which each term appears. (This list will serve as a preliminary search for and prior indication of specific words of potential interest. One can expect the using agencies who will have access to the thesaurus to learn rapidly to incorporate the appropriate key words in the body of the texts of those messages they wish to make convenient to retrieve.

Thesaurus development is a task best addressed with the help of a computer. Existing procedures permit the automatic counting of the frequency of appearance of various words in a large store of digitally coded textual material. A crude, preliminary thesaurus could be developed by simply counting (and retaining a record of the location of) all terms (other than the usual verbs, etc.) that appear in a selected sample of messages. (Much, if not most of this lengthy research work can be performed on one of the various governmental support facilities in the Washington area.)

Given the nature of governmental operations, one must expect the thesaurus to change over time as new terms, representing new interests, appear and old terms fall into disuse. A crude, initial indication of candidates for deletion can be had by reporting the frequency of requests using each thesaurus term. The agencies that have used the term should have the final decision as to whether or not it should be deleted. Nonuse of a term might mean no recent important developments named by that term rather than the disappearance of the term from the vocabulary of the national security community.

For example, the term *sub-Saharan* probably appears infrequently in messages relating to national security. It could -- and probably would -- suddenly become a household word in the event of a serious clash between the Union of South Africa and a group of sub-Saharan nations. Nonuse in the case of place-names does not imply assured unimportance.

Additional problems that must be dealt with in a systematic way have to do with message-aging and the evaluation of the quality (probable correctness and completeness) of received information.

Items, stored in the system, may become obsolete (a) if the objective situation changes, (b) if the item proves erroneous in that the originating agency has changed its evaluation, or (c) if an agency changes its "position" or its recommendation for action. In the interests of conserving file space and minimizing retrieval time a procedure for file review should be instituted.

Quality is a nebulous but very important concept. Clearly, some items must enter the system because, although they are probably inaccurate, the consequences to the United States would be great if they were accurate. It is probably best to charge the entering agencies with the task of evaluating and indicating an item's quality when it is entered and with changing its indicated quality if the objective situation changes.

The organizational position in which the contemplated system is located and its intended use practically insures that the various subscribing agencies will attempt to use it as an additional channel to influence national decisions. This could, upon occasion, lead to (possibly deliberate) overloading of the system, attempts at electronic "one-upmanship," and other of the familiar bureaucratic machinations. A surveillance system that allows central monitoring and control of the overall operation is essential. Rigid control procedures, some of which may require the exercise of very high-level authority, should probably be exercised outside of the system.

ADMINISTRATIVE SURVEILLANCE AND CONTROL

An interagency planning group should be established to address the problems related to security and policy and established rules for cooperation. The system design should include a series of administrative reports so that the planning group can be informed about system policies that are working well or in need of revision. For security purposes, reports recording who had access to what should be prepared. In addition, statistics recording the frequency and variety of inputs by location will allow the users of the system to be aware of the source supplying that information. Statistics of queries and responses will indicate those subscribers using the system and what features of the system they find valuable. Records describing the deficiencies in the existing thesaurus will prompt thesaurus correction and updating. Logs of unsuccessful queries will allow operator-training to be reviewed. Records giving the specifics of "help required" will provide inputs to advanced training and perhaps revision for books of procedures.

In addition to the functional information described above, administrative information concerning response time, error rates, costs, file sizes, average message length and other related operational data must be routinely prepared.

RM - 6054

AN INFORMATION SYSTEM FOR THE NATIONAL SECURITY COMMUNITY

Brown, Hammond, Jones and Patrick

Approved For Release 2001/08/07 : CIA-RDP84-00933R000300030005-3

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